FIG. 1

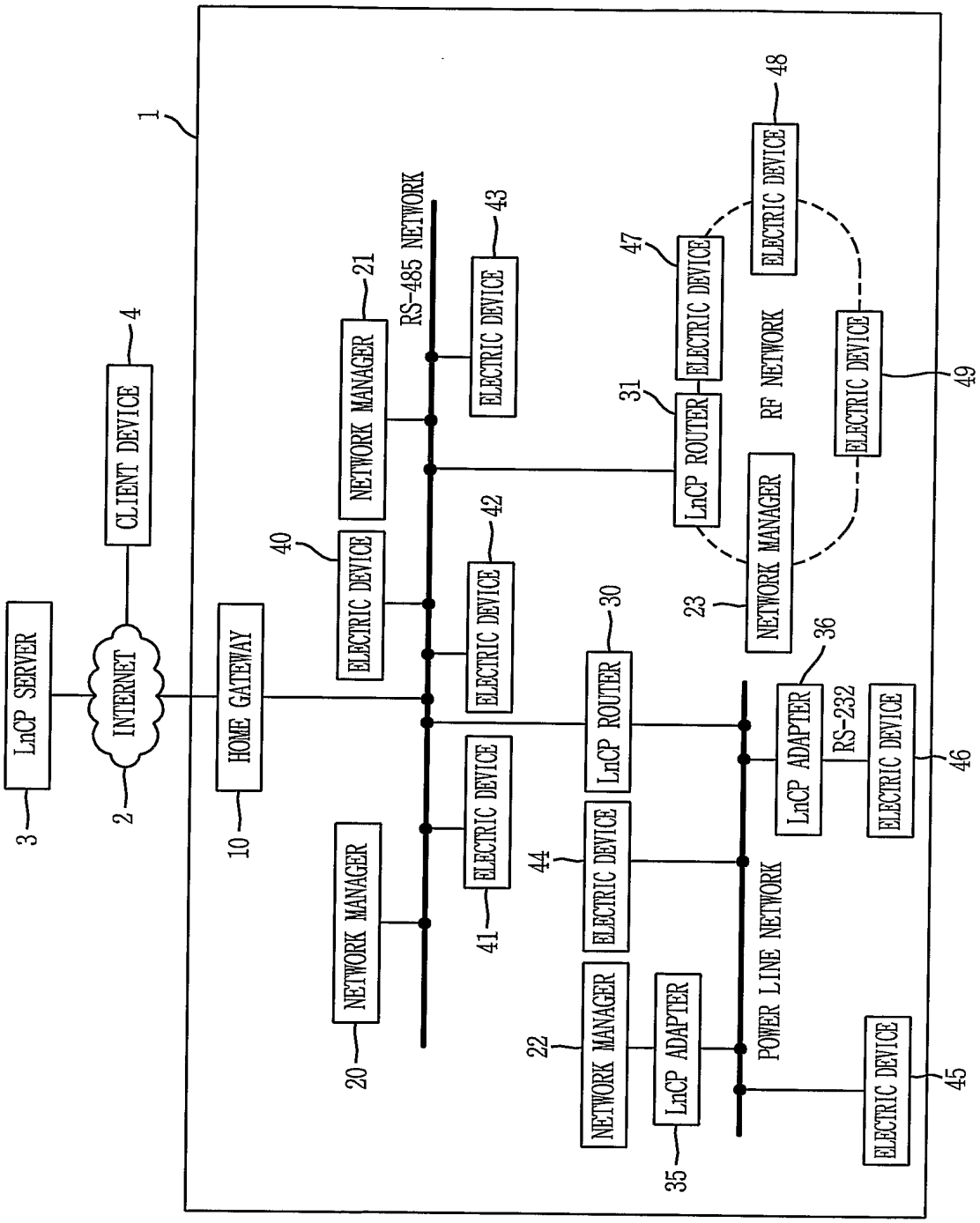

LnCP SERVER
3
INTERNET
2
CLIENT DEVICE
4
HOME GATEWAY
10
1
RS-485 NETWORK
NETWORK MANAGER
21
ELECTRIC DEVICE
43
ELECTRIC DEVICE
40
ELECTRIC DEVICE
42
LnCP ROUTER
30
NETWORK MANAGER
20
ELECTRIC DEVICE
41
ELECTRIC DEVICE
44
NETWORK MANAGER
22
LnCP ADAPTER
35
POWER LINE NETWORK
LnCP ADAPTER
36
RS-232
ELECTRIC DEVICE
46
ELECTRIC DEVICE
45
LnCP ROUTER
31
ELECTRIC DEVICE
47
ELECTRIC DEVICE
48
NETWORK MANAGER
23
RF NETWORK
ELECTRIC DEVICE
49

FIG.2

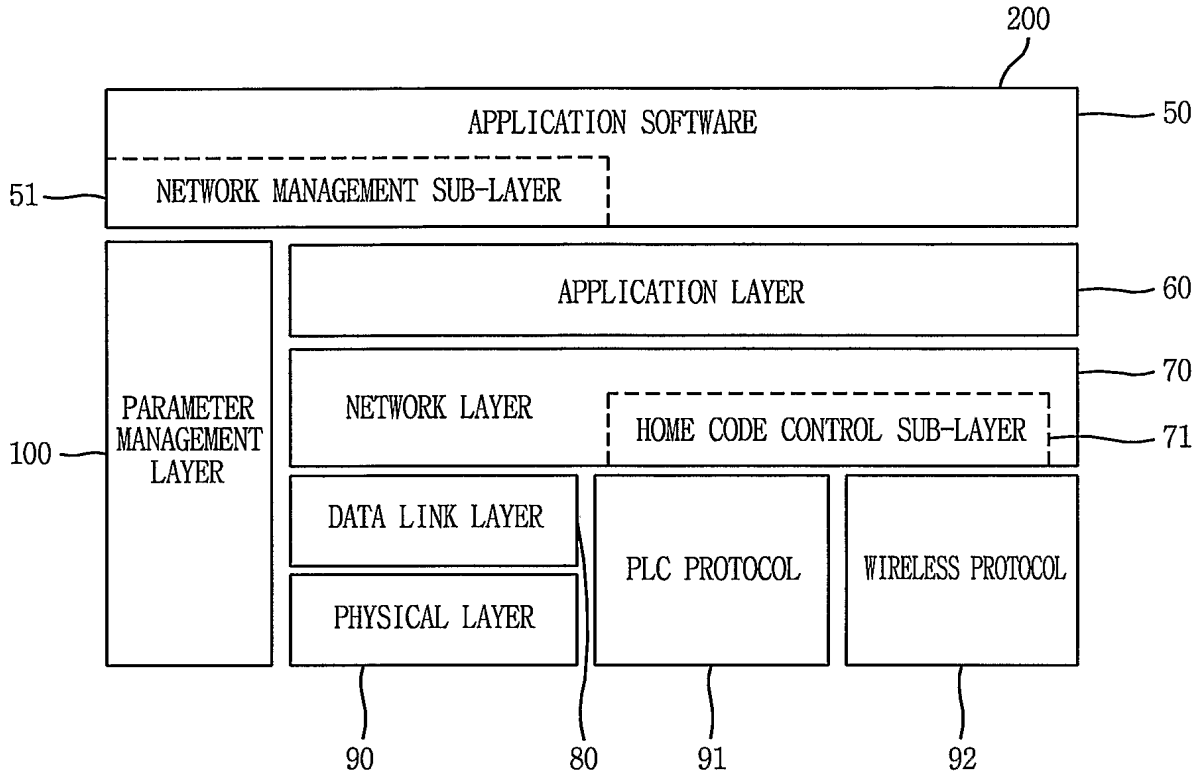

200
APPLICATION SOFTWARE
50
51
NETWORK MANAGEMENT SUB-LAYER
APPLICATION LAYER
60
70
NETWORK LAYER
HOME CODE CONTROL SUB-LAYER
71
PARAMETER MANAGEMENT LAYER
100
DATA LINK LAYER
PHYSICAL LAYER
PLC PROTOCOL
WIRELESS PROTOCOL
90
80
91
92

FIG.3

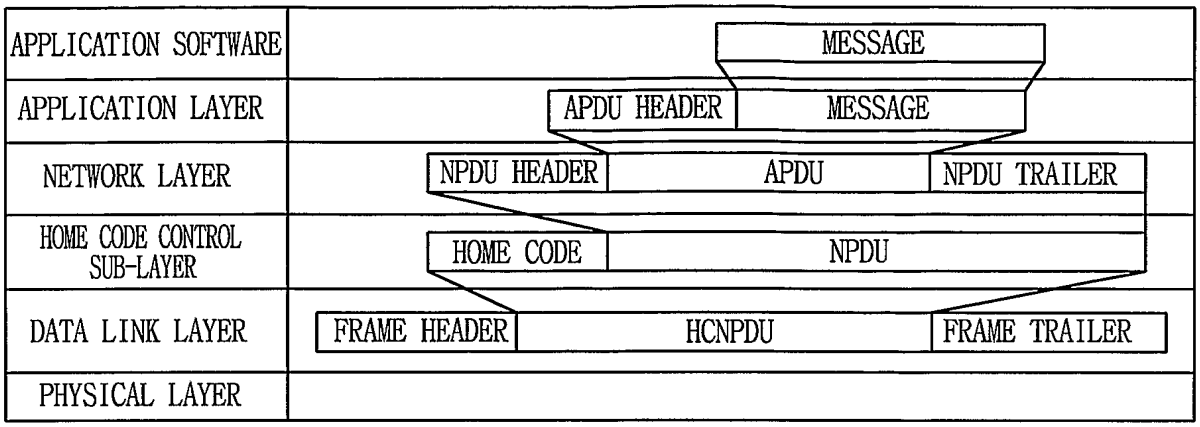

APPLICATION SOFTWARE
MESSAGE
APPLICATION LAYER
APDU HEADER
MESSAGE
NETWORK LAYER
NPDU HEADER
APDU
NPDU TRAILER
HOME CODE CONTROL SUB-LAYER
HOME CODE
NPDU
DATA LINK LAYER
FRAME HEADER
HCNPDU
FRAME TRAILER
PHYSICAL LAYER

FIG.4

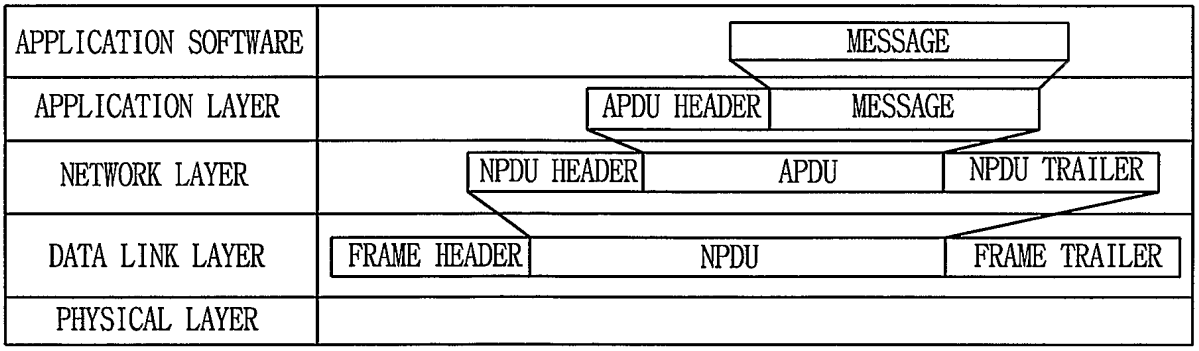

APPLICATION SOFTWARE
MESSAGE
APPLICATION LAYER
APDU HEADER
MESSAGE
NETWORK LAYER
NPDU HEADER
APDU
NPDU TRAILER
DATA LINK LAYER
FRAME HEADER
NPDU
FRAME TRAILER
PHYSICAL LAYER

FIG.5

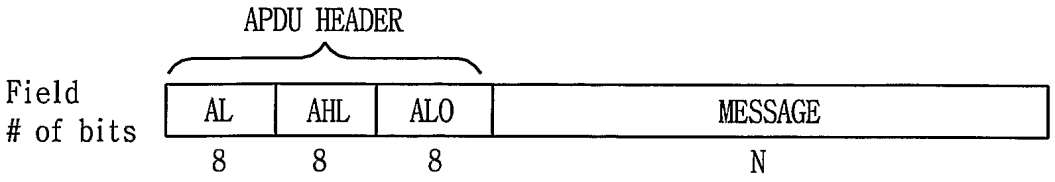


FIG.6

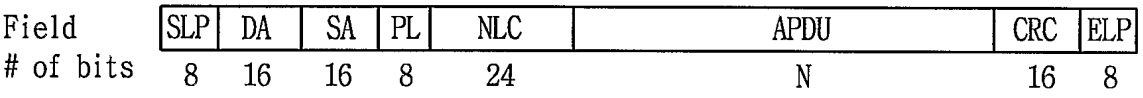


FIG.7

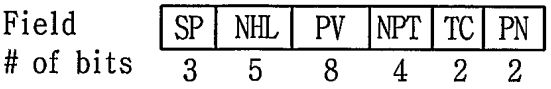


FIG.8

FIG.9

FIG.10

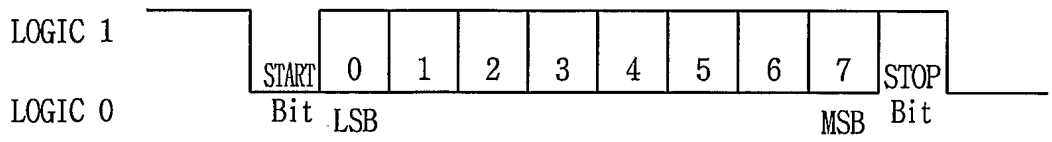


FIG. 11

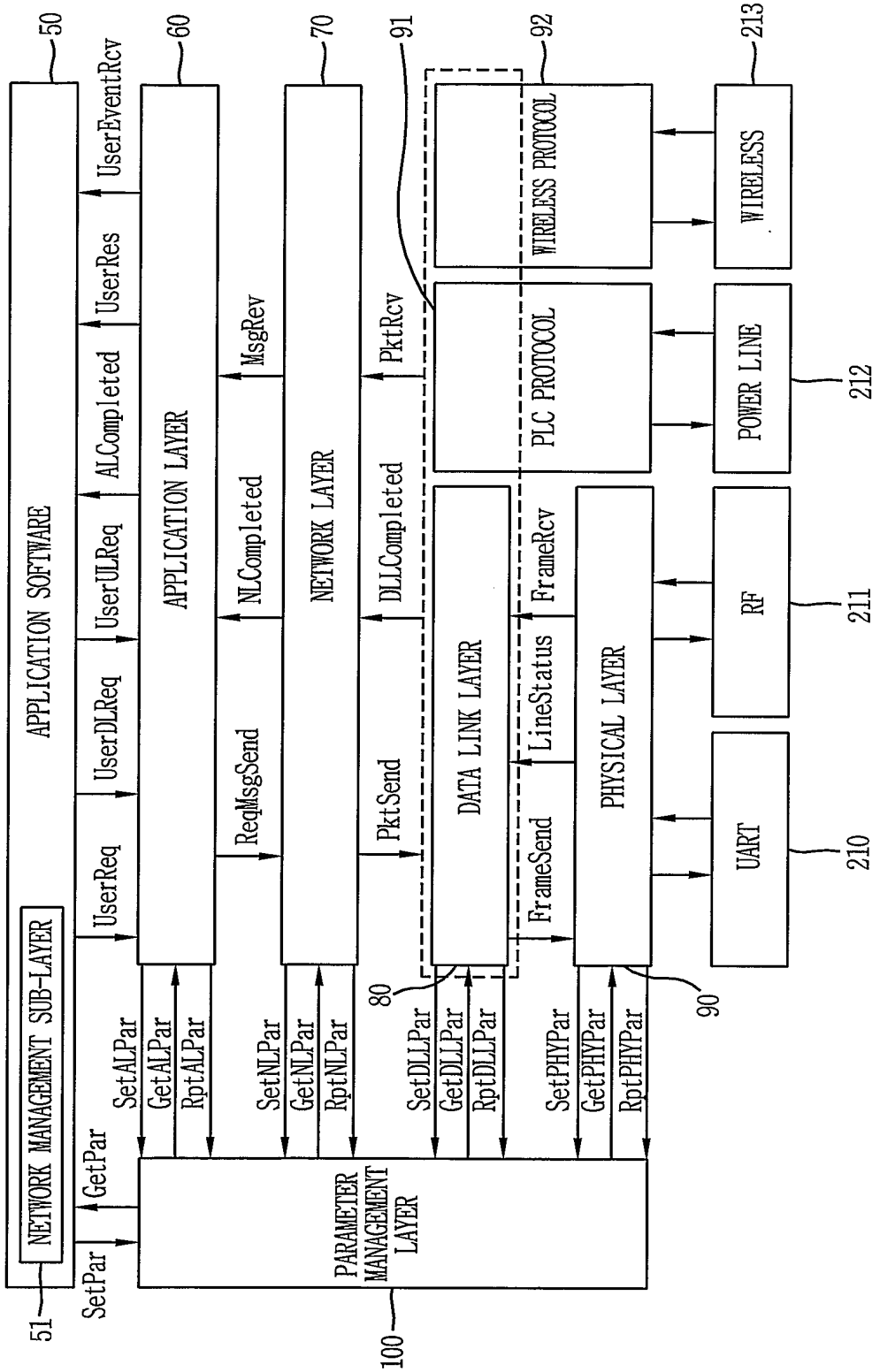

APPLICATION SOFTWARE
50
NETWORK MANAGEMENT SUB-LAYER
51
SetPar
GetPar
UserReq
UserDLReq
UserULReq
ALCompleted
UserRes
UserEventRcv
APPLICATION LAYER
60
ReqMsgSend
NLCompleted
MsgRev
NETWORK LAYER
70
PktSend
DLLCompleted
PktRcv
DATA LINK LAYER
80
91
FrameSend
LineStatus
FrameRcv
PHYSICAL LAYER
90
PLC PROTOCOL
WIRELESS PROTOCOL
92
UART
RF
POWER LINE
WIRELESS
210
211
212
213
PARAMETER MANAGEMENT LAYER
100
SetALPar
GetALPar
RptALPar
SetNLPar
GetNLPar
RptNLPar
SetDLLPar
GetDLLPar
RptDLLPar
SetPHYPar
GetPHYPar
RptPHYPar

FIG. 12

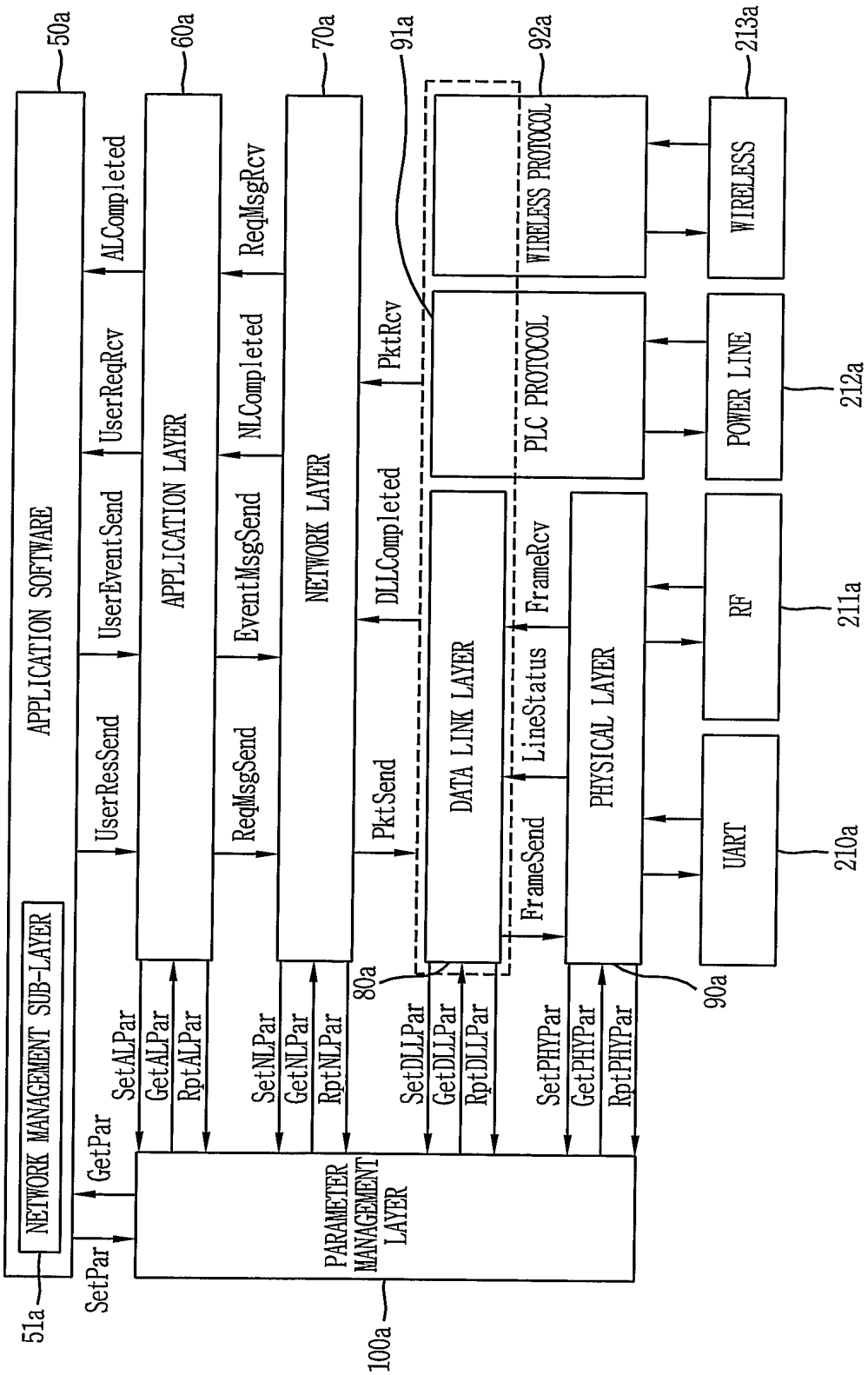

APPLICATION SOFTWARE
50a
NETWORK MANAGEMENT SUB-LAYER
51a
APPLICATION LAYER
60a
NETWORK LAYER
70a
DATA LINK LAYER
80a
PHYSICAL LAYER
90a
PLC PROTOCOL
91a
WIRELESS PROTOCOL
92a
UART
210a
RF
211a
POWER LINE
212a
WIRELESS
213a
PARAMETER MANAGEMENT LAYER
100a
UserReqRcv
ALCompleted
UserEventSend
NLCompleted
ReqMsgRcv
EventMsgSend
PktRcv
DLLCompleted
PktSend
FrameRcv
LineStatus
FrameSend
UserResSend
ReqMsgSend
SetPar
GetPar
SetALPar
GetALPar
RptALPar
SetNLPar
GetNLPar
RptNLPar
SetDLLPar
GetDLLPar
RptDLLPar
SetPHYPar
GetPHYPar
RptPHYPar

FIG. 13

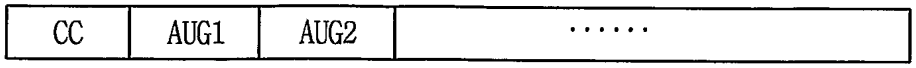


FIG. 14

FIG. 15

FIG. 16

FIG. 17

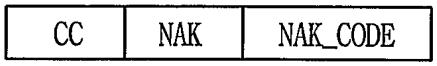


FIG. 18

FIG. 19

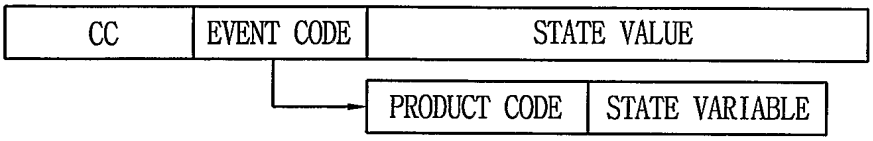


FIG.20

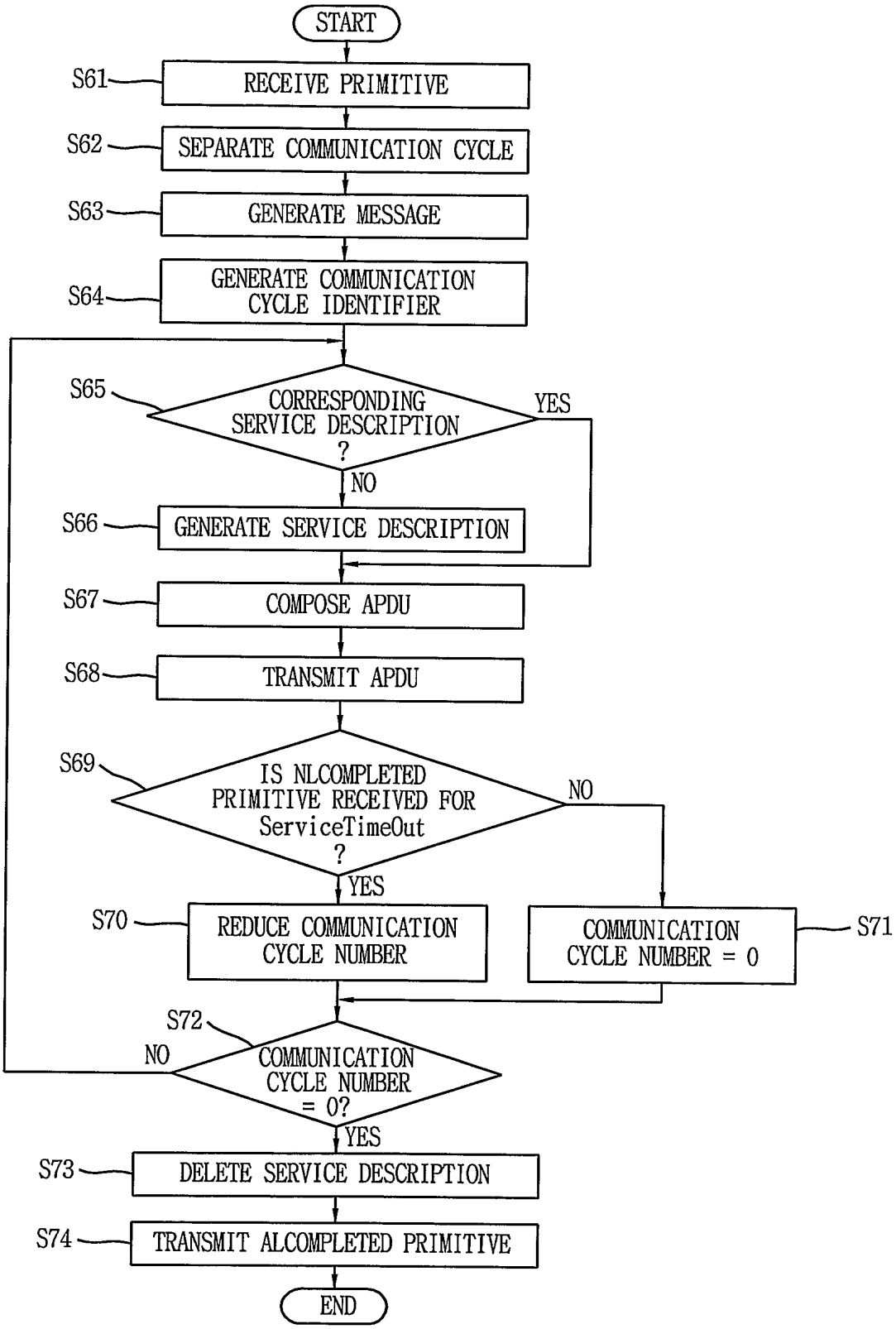

START
S61
RECEIVE PRIMITIVE
S62
SEPARATE COMMUNICATION CYCLE
S63
GENERATE MESSAGE
S64
GENERATE COMMUNICATION CYCLE IDENTIFIER
S65
CORRESPONDING SERVICE DESCRIPTION ?
YES
NO
S66
GENERATE SERVICE DESCRIPTION
S67
COMPOSE APDU
S68
TRANSMIT APDU
S69
IS NLCOMPLETED PRIMITIVE RECEIVED FOR ServiceTimeOut ?
NO
YES
S70
REDUCE COMMUNICATION CYCLE NUMBER
COMMUNICATION CYCLE NUMBER = 0
S71
S72
NO
COMMUNICATION CYCLE NUMBER = 0?
YES
S73
DELETE SERVICE DESCRIPTION
S74
TRANSMIT ALCOMPLETED PRIMITIVE
END

FIG.21

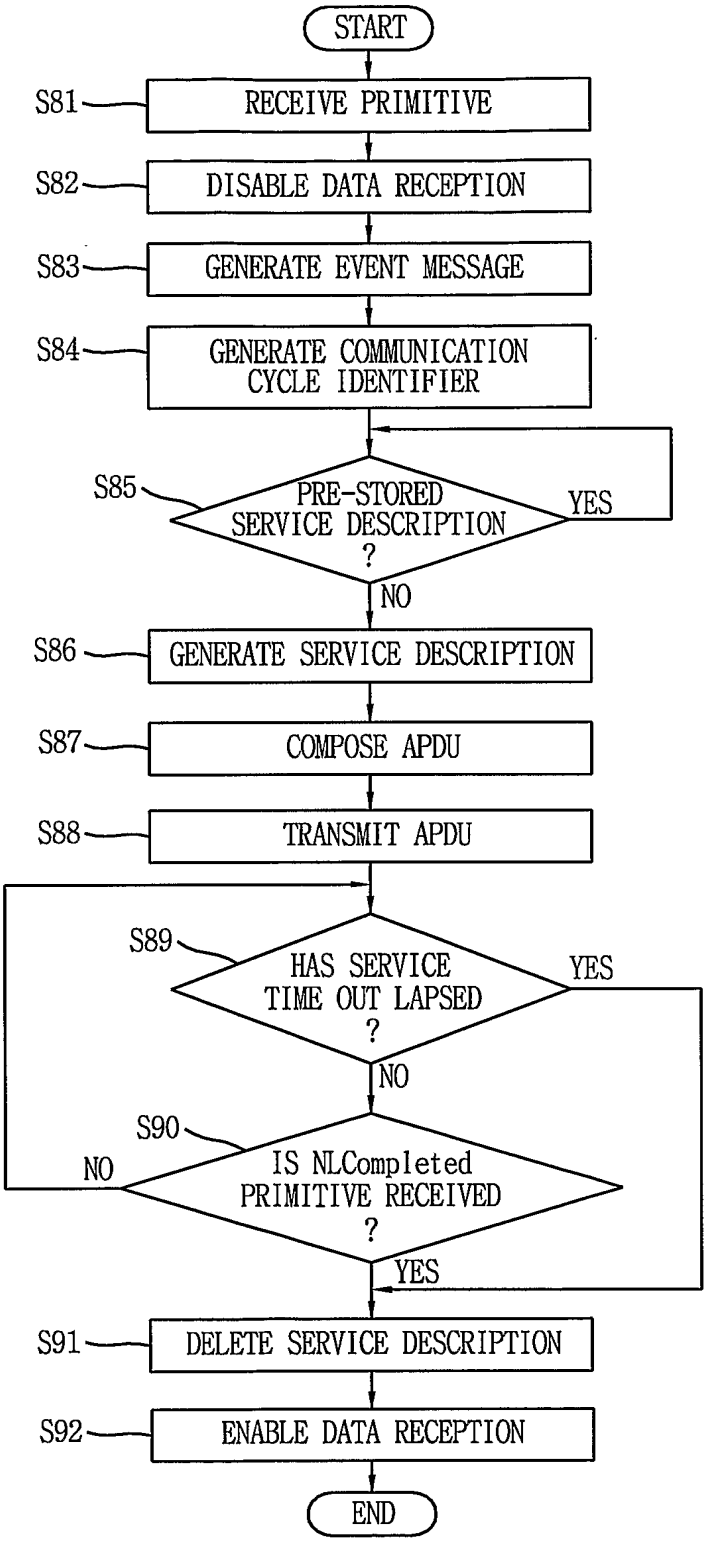

START
S81
RECEIVE PRIMITIVE
S82
DISABLE DATA RECEPTION
S83
GENERATE EVENT MESSAGE
S84
GENERATE COMMUNICATION CYCLE IDENTIFIER
S85
PRE-STORED SERVICE DESCRIPTION ?
YES
NO
S86
GENERATE SERVICE DESCRIPTION
S87
COMPOSE APDU
S88
TRANSMIT APDU
S89
HAS SERVICE TIME OUT LAPSED ?
YES
NO
S90
IS NLCompleted PRIMITIVE RECEIVED ?
NO
YES
S91
DELETE SERVICE DESCRIPTION
S92
ENABLE DATA RECEPTION
END

FIG.22

Field	NODE ADDRESS	0x00	COMMAND CODE
# of bits	16	8	8

FIG. 23

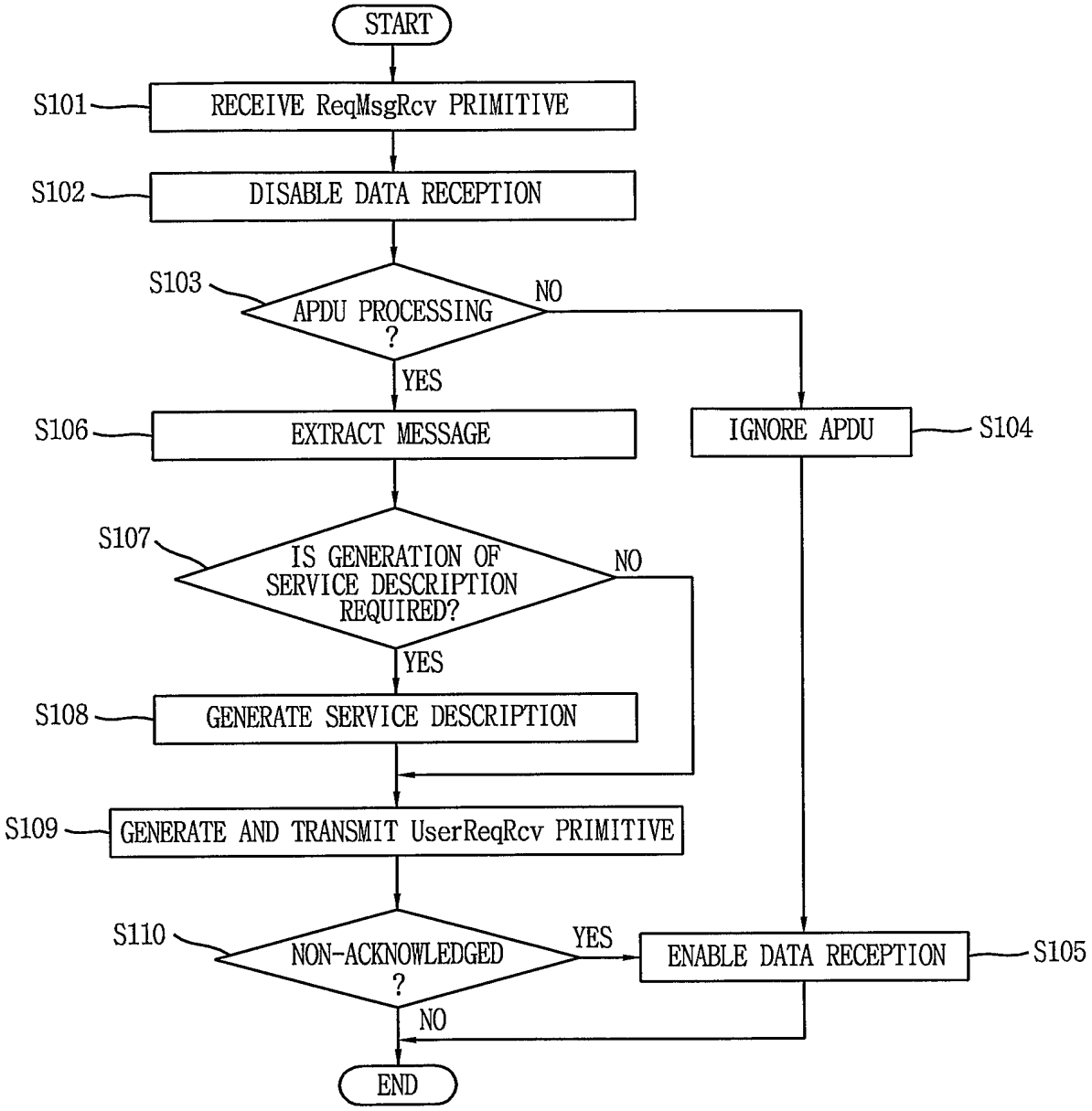

START
S101
RECEIVE ReqMsgRcv PRIMITIVE
S102
DISABLE DATA RECEPTION
S103
APDU PROCESSING ?
NO
YES
S106
EXTRACT MESSAGE
IGNORE APDU
S104
S107
IS GENERATION OF SERVICE DESCRIPTION REQUIRED?
NO
YES
S108
GENERATE SERVICE DESCRIPTION
S109
GENERATE AND TRANSMIT UserReqRcv PRIMITIVE
S110
NON-ACKNOWLEDGED ?
YES
ENABLE DATA RECEPTION
S105
NO
END

FIG.24

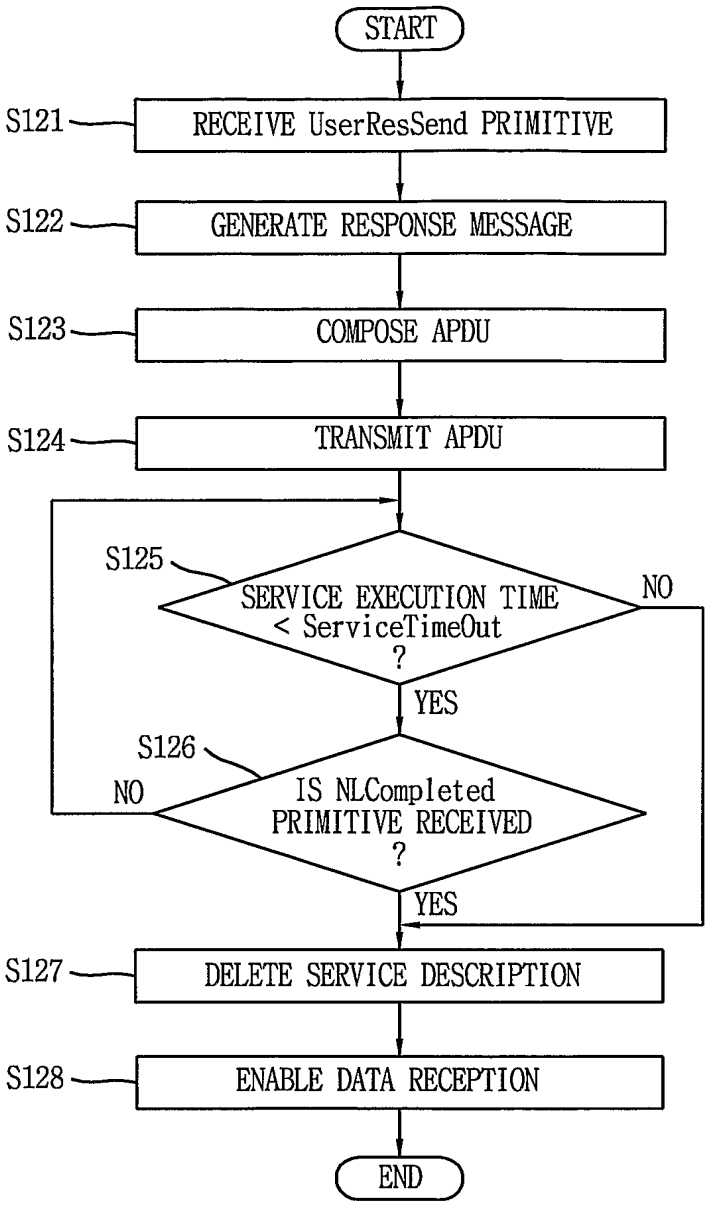
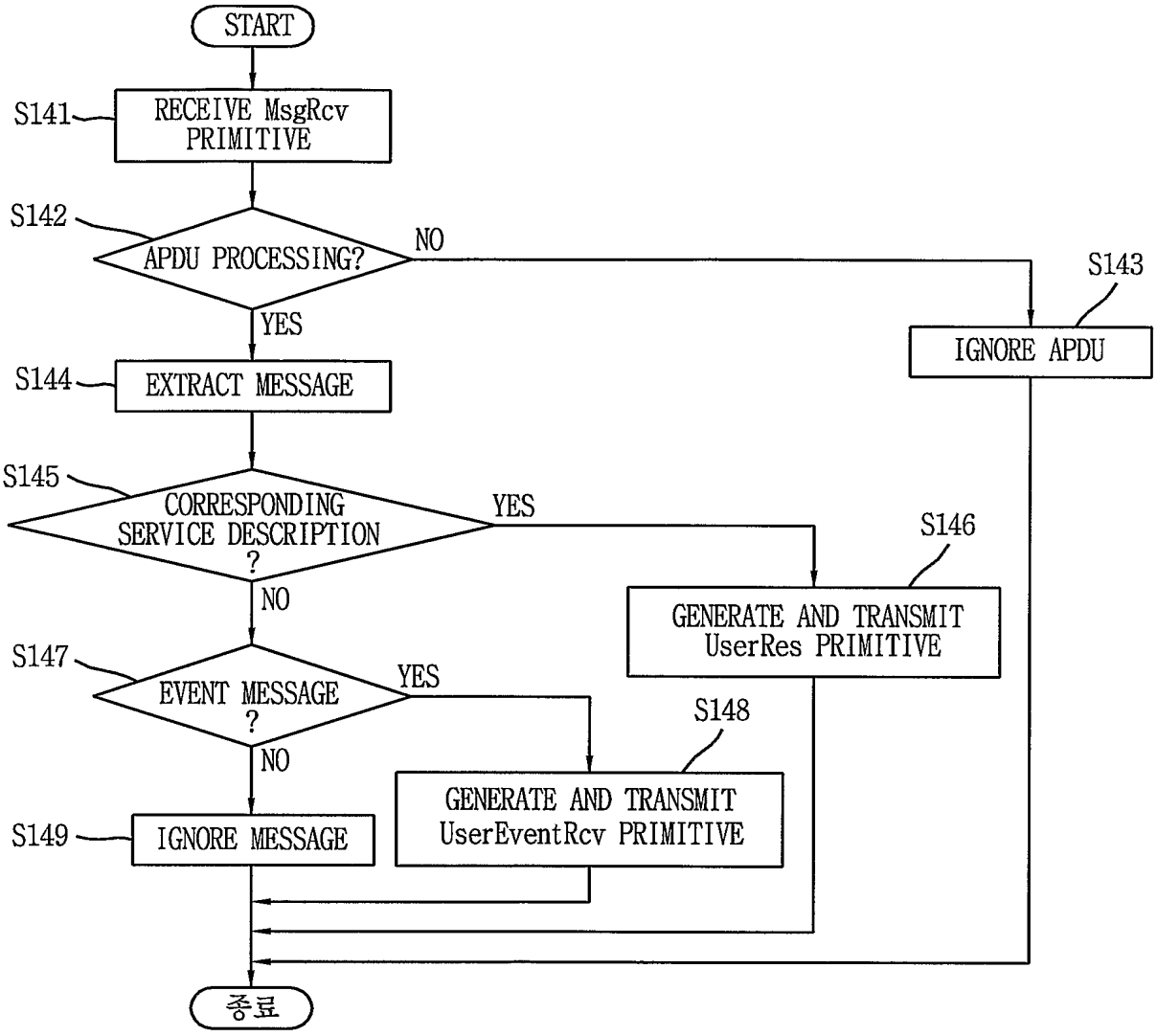

START
S121
RECEIVE UserResSend PRIMITIVE
S122
GENERATE RESPONSE MESSAGE
S123
COMPOSE APDU
S124
TRANSMIT APDU
S125
SERVICE EXECUTION TIME < ServiceTimeOut ?
NO
YES
S126
IS NLCompleted PRIMITIVE RECEIVED ?
NO
YES
S127
DELETE SERVICE DESCRIPTION
S128
ENABLE DATA RECEPTION
END

FIG.25


START
S141
RECEIVE MsgRcv PRIMITIVE
S142
APDU PROCESSING?
NO
S143
IGNORE APDU
YES
S144
EXTRACT MESSAGE
S145
CORRESPONDING SERVICE DESCRIPTION ?
YES
S146
GENERATE AND TRANSMIT UserRes PRIMITIVE
NO
S147
EVENT MESSAGE ?
YES
S148
GENERATE AND TRANSMIT UserEventRcv PRIMITIVE
NO
S149
IGNORE MESSAGE
종료